MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

EEN1026 – ELECTRONICS II

(TE/RE)

2 MARCH 2019
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTION TO STUDENT

1. This Question paper consists of 6 pages including cover page with 4 Questions only.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. State all the assumptions clearly.

Question 1

(a)

(i) With suitable labels, sketch a typical output characteristic curve of an n-channel JFET.

[2 marks]

(ii) Draw an appropriate labelled sketch showing the construction of an n-channel JFET and a p-channel JFET.

[3 marks]

(b) For the JFET voltage divider configuration shown in Figure Q1(b), determine the value of R_S. Given $R_1 = 91k\Omega$, $R_2 = 47k\Omega$, $R_D = 1.8k\Omega$, $V_{DD} = 16V$, $V_{GS} = -2V$ and the drain voltage $V_D = 12V$.

[6 marks]

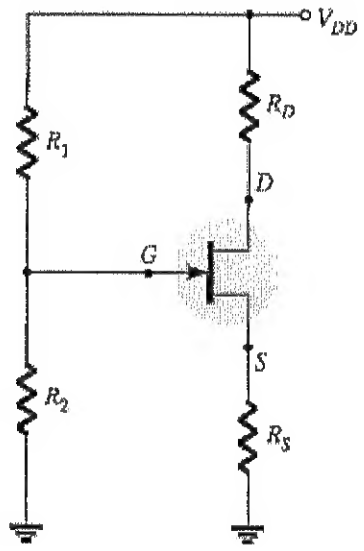

Figure Q1(b)

(c) The common drain (source follower) configuration circuit has the operating parameters as $V_{GS} = -3.0V$, $I_{DSS} = 15$ mA, and $V_P = -6V$ as shown in Figure Q1(c). Given $R_G = 1.5M\Omega$, $R_S = 3.6k\Omega$, $V_{DD} = 20V$ and $r_d = \infty$.

Note: The coupling and bypass capacitors are sufficiently large at the operating frequency such that they can be represented by short circuit for small signals.

(i) Draw a small-signal ac equivalent circuit with the transistor model.

[3 marks]

(ii) Determine the forward transconductance, g_m.

[3 marks]

(iii) Calculate the input impedance, Z_i.

[2 marks]

Continued...

(iv) Calculate the output impedance, Z_o.

[3 marks]

(v) Calculate the voltage gain, A_v.

[3 marks]

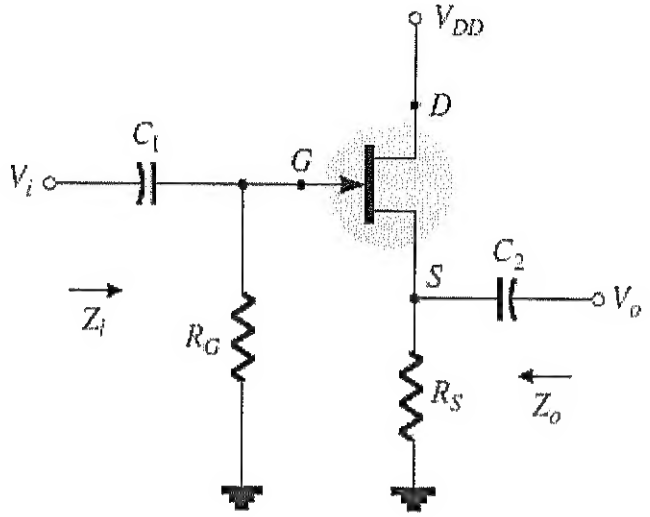

Figure Q1(c)

Question 2

(a)

(i) Give three main reasons for distortion in the output signal of a class A amplifier circuit.

[3 marks]

(ii) Draw the output signal of a class A amplifier circuit if the operating point (Q-point) of the amplifier circuit is shifted to a larger value until distortion occurs. Give the reason on the shape of signal which you have drawn.

[5 marks]

(iii) The input and output signals of a class A amplifier circuit is shown in Figure Q2(a). Give the reason why the output signal is distorted and what will be its effect on the efficiency of the amplifier circuit.

[4 marks]

Continued...

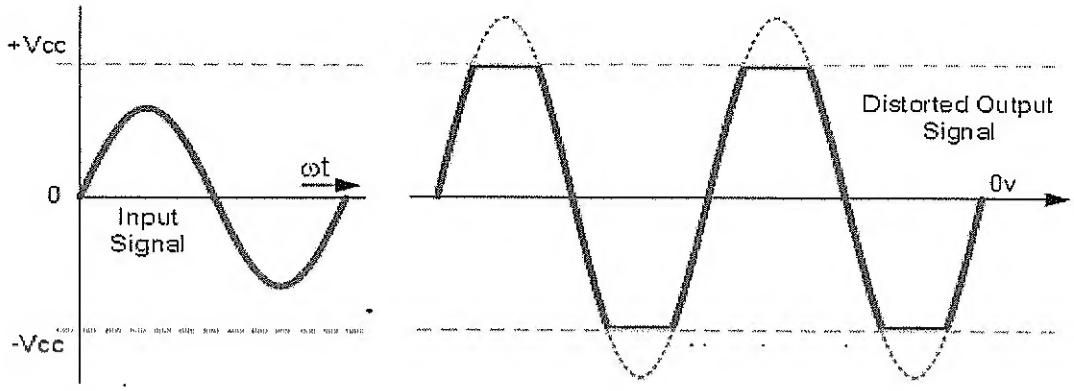

Figure Q2(a)

(b) A common emitter (CE) amplifier circuit is shown in Figure Q2(b). Calculate the lower cutoff frequencies caused by capacitors C_E and C_C, separately. Given that $R_S = 80\Omega$, $C_S = 0.5\mu F$, $R_1 = 100k\Omega$, $R_2 = 33k\Omega$, $R_C = 2.2k\Omega$, $R_E = 1k\Omega$, $C_E = 10\mu F$, $R_L = 5.2k\Omega$, $C_C = 0.2\mu F$, $h_{ie} = 1k\Omega$ and $h_{fe} = 100$. Assume that $h_{oe} = 0$ and $h_{re} = 0$.

[13 marks]

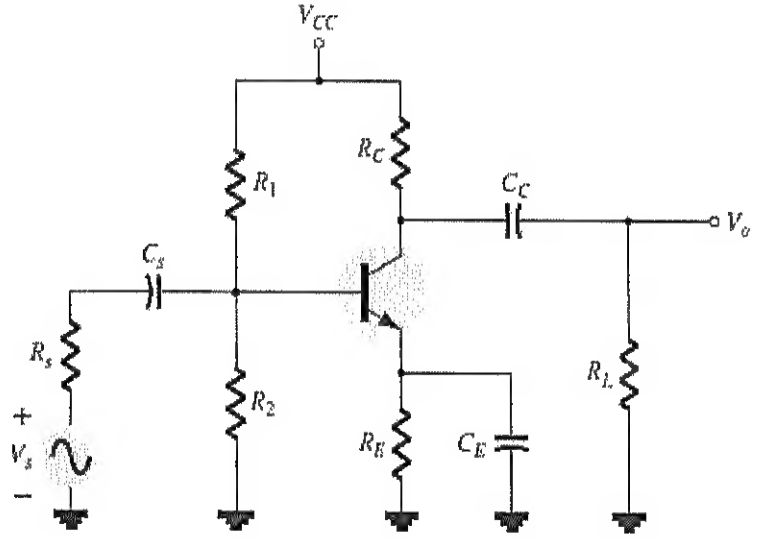

Figure Q2(b)

Question 3

(a) Class-B amplifiers have a higher efficiency compared to class-A amplifiers. Briefly explain the reason and state the major drawback of the class-B amplifiers compared to class-A amplifiers.

[5 marks]

Continued...

(b) Determine the efficiency of a Class B complementary symmetry amplifier circuit which has V_{CC}=15V, I_{CC} = 200 mA and R_L=10 Ω.

[8 marks]

(c) A class-A power amplifier is shown in Figure Q3(c). With the assumption that the β of the BJT is arbitrarily large, given R_1 = 1*k*Ω, R_2 = 1*k*Ω, R_C = 200Ω, R_E = 300Ω, R_L = 1kΩ and V_{CC} = 6V.

(i) Calculate and draw the DC load line

[2 marks]

(ii) Calculate and draw AC load line

[6 marks]

(iii) Deduce the compliance of the amplifier

[4 marks]

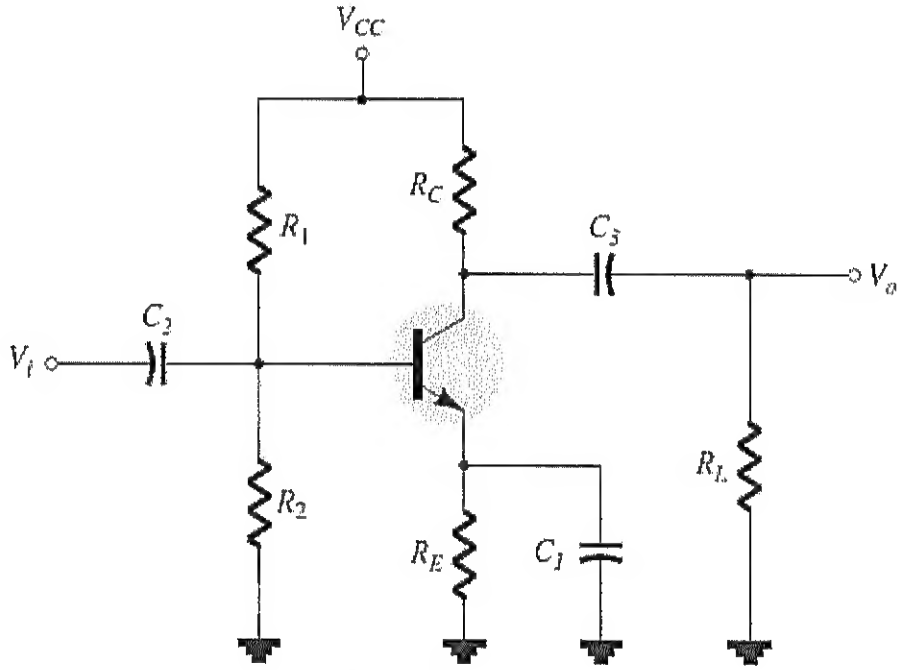

Figure Q3(c)

Question 4

(a) The 555 monostable multivibrator shown in Figure Q4(a) has following parameters: V_{CC} = 10V, R = 10kΩ, C = 1μF.

(i) Draw the waveforms across pins 6 and 3

[2 marks]

(ii) Calculate the pulse width of the output waveform.

[3 marks]

Continued...

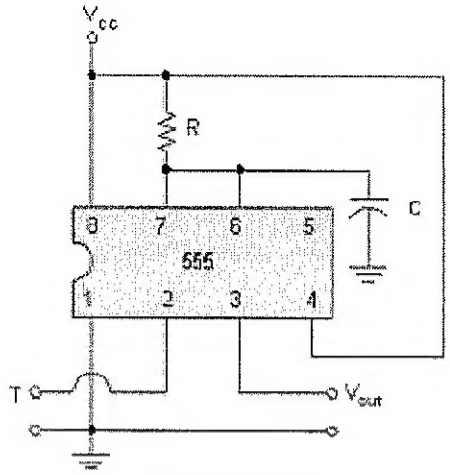

Figure Q4(a)

(b) A bistable multivibrator circuit is shown in Figure Q4(b).

(i) Describe the operation of the multivibrator.

[6 marks]

(ii) Analyze the multivibrator circuit in Figure Q4(b). Assume that initially transistor Q_2 saturates and transistor Q_1 is cut-off. Find I_{L1}, V_{B1}, V_{CE1}, I_{C2}, I_{RB2} and I_{Q2B}. Assume that $V_{CE(sat)} = 0.2V$ and $V_{BE(on)} = 0.7V$.

[12 marks]

(iii) Deduce the minimum h_{FE} of the transistors for the circuit to function.

[2 marks]

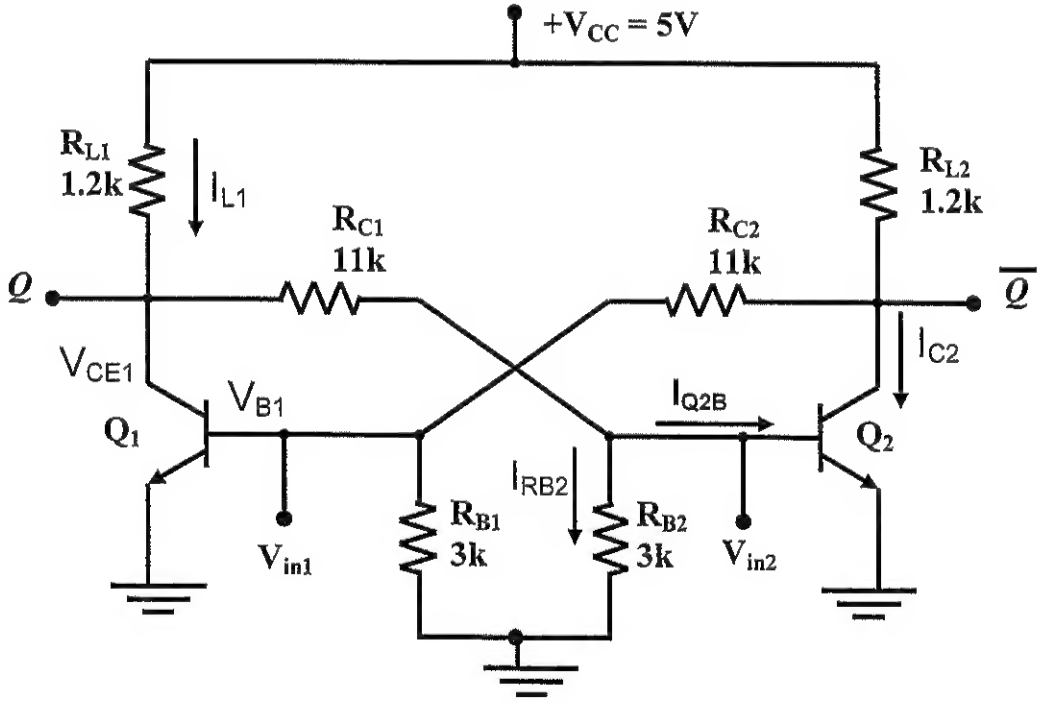

Figure Q4(b)

End of paper